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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/702,046	11/06/2003	Huaiyu Pan	038871.52853US	7395

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EXAMINER	
LEUNG, RICHARD L	
ART UNIT	**PAPER NUMBER**
3744	

DATE MAILED: 10/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/702,046	PAN ET AL.	
	Examiner	Art Unit	
	Richard L. Leung	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 November 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Oath/Declaration

1. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

> The oath or declaration is defective because:
> It does not identify the foreign application for patent or inventor's certificate on which priority is claimed pursuant to 37 CFR 1.55, and any foreign application having a filing date before that of the application on which priority is claimed, by specifying the application number, country, day, month and year of its filing.
>
> Specifically, the country of the foreign application on which priority is claimed does not match the country specified in the declaration.

Drawings

2. Figures 1-5 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 126, 128, 130, 132.

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 123.

5. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures

appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Information Disclosure Statement

6. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 16 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: providing the PTR with a refrigerator sock containing a helium column, the helium column being the atmosphere surrounding the tubes of the PTR assembly. Such steps are considered critical to Applicant's invention since the only method enabled by Applicant's specification is the

transfer of heat from a helium column defined by a refrigerator sock to the regenerator by way of fins situated on the regenerator.

9. Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

10. Claim 17 recites the limitation "the recondensor" in the first line of the claim. There is insufficient antecedent basis for this limitation in the claim. As best understood, "the recondensor" should read, --the PTR--. Appropriate correction is required to overcome this rejection.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 1, 2, and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by US 5295355 (Zhou et al.). Zhou et al. disclose a pulse tube refrigerator (PTR) comprising a regenerator tube (2) and pulse tube (5), as is conventional in the art, and further comprising radiator fins arranged across part of the length of the regenerator tube (2'). See Fig. 2. It is also disclosed that the regenerator tube (2) is fabricated from a thin walled stainless steel tube (column 3, lines 66-68), a material understood to be an alloy that has a moderate thermal conductivity at low temperatures. It is inherent that the PTR is used within some cryogenic apparatus.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 1-5 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6378312 B1 (Wang) in view of US 5295355 (Zhou et al.). Wang discloses a pulse tube refrigerator (PTR) arrangement and discloses an application of the PTR in a magnetic resonance imaging apparatus (column 2, lines 17-21). The PTR may comprise a single stage (Fig. 1) or multiple stages (Fig. 2), each stage including a regenerator tube (60, 61, 62) and a pulse tube (70, 71, 72), as is already well known in the art. Wang fails to expressly disclose that any of the regenerator tubes (60, 61, 62) are finned or are fabricated from a thin walled alloy, which has a moderate thermal conductivity at low temperatures. Zhou et al. teach a PTR arrangement wherein a regenerator tube (2) is provided with radiator fins across part of the length of the tube (Fig. 2). Zhou et al. further teach that the regenerator tube is fabricated from a thin walled alloy, preferably stainless steel (column 3, lines 66-68), which is understood to have a moderate thermal conductivity at low temperatures. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided fins on any of the regenerators (60, 61, 62) disclosed by Wang in the manner taught by Zhou et al. because Zhou et al. expressly teach that the radiator fins can be implemented to reject heat from the hot end (2') of the regenerator (column 3, lines 44-46). It should be noted that while Zhou et al. specifically teach an example of a PTR

arrangement with only a single stage, it would have been obvious to one of ordinary skill in the art to have provided the fins on either the first or the second or both regenerator tubes in a multi-stage PTR arrangement since each stage is analogous in structure and function. It would have also been obvious to one of ordinary skill in the art at the time the invention was made to have fabricated the regenerator tube (60, 61, 62) disclosed by Wang from a thin walled alloy which has a moderate thermal conductivity at low temperatures as taught by Zhou et al. because Zhou et al. suggest that using this material is preferable in order to achieve a low temperature with the PTR (column 3, line 66-column 4, line 5).

15. Claims 6-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5295355 (Zhou et al.). As already discussed above, Zhou et al. disclose a pulse tube refrigerator comprising a regenerator tube (2) that is externally finned (Fig. 2). Zhou et al. fail to expressly disclose the arrangement of the fins, specifically that they are disposed in the various manners recited by the claims. At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to have configured the fins in the PTR disclosed by Zhou et al. to be annular fins, spiral strips, rectangular sheets, prongs, or the other various shape and special arrangements recited by the claims because Applicant has not disclosed that these specific arrangements provide an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with the system disclosed by Zhou et al. because the specific fin shape and arrangement has not been shown to be

critical to the operation of the PTR. Therefore, it would have been an obvious matter of design choice to modify the system disclosed by Zhou et al. to obtain the invention as specified in the claims.

16. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5295355 (Zhou et al.) in view of US 5107683 (Chan et al.). As already discussed above, Zhou et al. disclose all the limitations of the claim, except for the pulse tube having insulated walls. Chan et al. teach a multistage pulse tube refrigerator wherein the pulse tubes are preferably insulated (column 4, lines 47-49). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the pulse tube in the system disclosed by Zhou et al. with insulation as taught by Chan et al. because Chan et al. expressly teaches that insulation prevents extraneous heat leakage, which would be a parasitic heat load on the system (column 4, lines 47-50).

Allowable Subject Matter

17. Claims 16 and 17 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

> US 6691520 B2 (Kamoshita et al.): discloses a cryogenic apparatus (cryocooler) with a pulse tube refrigerator arrangement comprising a regenerator tube that has fins arranged externally on part of the length of the tube.

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard L. Leung whose telephone number is 703-306-4154. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Denise L. Esquivel can be reached on 703-308-2597. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Richard L. Leung
Examiner
Art Unit 3744

rll

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SUPERVISORY PATENT EXAMINER
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